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EXAMINER

LUND, JEFFRIE ROBERT

ART UNIT

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/817,131
Filing Date: April 02, 2004
Appellant(s): HUI, ANGELA T.

Himanshu S. Amin
For Appellant

MAILED
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GROUP 1700

EXAMINER'S ANSWER

This is in response to the appeal brief filed October 11, 2006 appealing from the Office action mailed May 10, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows:

A. Whether claims 1-16 and 20 are anticipated under 35 U.S.C. § 102(b) by Carducci et al. (US 2003/0037880).

B. Whether claims 1- 20 are anticipated under 35 U.S.C. § 102(e) by Grimbergen et al. (US 6,835,275).

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

Art Unit: 1763

(8) Evidence Relied Upon

2003/0037880 A1	Carducci et al	2-2003
6,835,275 B1	Grimbergen et al	12/2004

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-16, and 20 rejected under 35 U.S.C. 102(b) as being anticipated by Carducci et al, US Patnet Application Publication 2003/0037880 A1.

Carducci et al teaches a plasma processing apparatus that includes: a gas distribution system 350, 103, 105 for supplying CF₄ (see paragraphs 0214, 0218) to the processing chamber 112; an excitation system including an electrode 105 or RF coil 3105, 3115, 3202, connected to a voltage source 150, 3110, 3204 to form a plasma and excite the fluorine based gas; a temperature control system 121; a pressure control system 8, 109; and a controller 140 for controlling the gas distribution system, excitation system, pressure control system, and heating system. Carducci et al also teaches a

Art Unit: 1763

substrate having a copper layer 3810 covered by dielectric layers 3830, 3825, 3820, 3815 and mask layer 3835. The copper layer is exposed to the plasma when the trench (via) 3865 is formed (paragraphs 0218-0226). Carducci et al further teaches forming a passivation layer on structures (paragraph 0011). (Entire document, specifically, figures 1, 31, 32, 38A, and 38B) Claims 3-16 are directed to the coatings found on the substrate being processed in the apparatus.

It has been held that:

a) "Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim." (*Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969)) Furthermore, "Inclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims." *In re Young*, 25 USPQ 69 (CCPA 1935) (as restated in *In re Otto*, 136 USPQ 458, 459 (CCPA 1963)); and

b) Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531, (CCPQ 1959); "Apparatus claims cover what a device is, not what a device does" (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990); and a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus " if the prior art apparatus teaches all

Art Unit: 1763

the structural limitations of the claim *Ex parte Masham*, 2 USPQ2d 1647

(Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

The apparatus of Carducci et al has the claimed structure and is capable of processing substrates having the claimed layers and features, with the desired process method.

3. Claims 1-20 rejected under 35 U.S.C. 102(e) as being anticipated by Grimbergen et al, US Patnet 6,835,275 B1.

Grimbergen et al teaches a plasma processing apparatus that includes: a gas distribution system 70 for supplying CF₄ and SF₆ (column 14 lines 20-25) to the processing chamber 40; an excitation system including an electrode 45 and RF coil 100, connected to a voltage source 104, 102 to form a plasma and excite the fluorine based gas; a temperature control system (column 14 lines 8-10); a pressure control system 90, 95; an ellipsometry or interferometry measurement system 25 that monitors the layer being worked on; and a controller 155 which receives input from the measurement system and controls the measurement system, gas distribution system, excitation system, pressure control system, and heating system to facilitate the desired thickness or composition of the layer being formed, or the rate at which the layer is being formed. (Entire document, specifically, figure 1A-1C) Claims 3-16 are directed to the coatings found on the substrate being processed in the apparatus.

It has been held that:

a) "Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim." (*Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969))

Art Unit: 1763

Furthermore, "Inclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims." *In re Young*, 25 USPQ 69 (CCPA 1935) (as restated in *In re Otto*, 136 USPQ 458, 459 (CCPA 1963)); and

b) Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531, (CCPQ 1959); "Apparatus claims cover what a device is, not what a device does" (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990); and a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus " if the prior art apparatus teaches all the structural limitations of the claim *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

The apparatus of Grimbergen et al has all of the claimed structure and is capable of processing substrates having the claimed layers and features, with the desired process method.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Art Unit: 1763

Patentability shall not be negated by the manner in which the invention was made.

5. Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carducci et al, US Patent Application Publication 2003/0037880 A1, in view of Grimbergen et al, US Patent 6,835,275 B1.

Carducci et al was discussed above.

Carducci et al differs from the present invention in that Carducci et al does not teach a measurement system.

Grimbergen et al was discussed above and teaches a measurement system.

The motivation for adding the measurement system of Grimbergen et al to the apparatus of Carducci et al is to provide a means for measuring the progress of the process, to provide real time feed back to control the apparatus, and to indicate the end of the process as taught by Grimbergen et al.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add the measurement system of Grimbergen et al to the apparatus of Carducci et al.

(10) Response to Argument

In regard to the argument:

"Carducci et al. provides a thermally controlled plasma etch chamber for etch processing of substrates at sub-atmospheric pressure. Carducci et al. is merely concerned with preparing a substrate for etching. The cited reference does not teach, suggest, or even contemplate memory cell formation let alone an excitation system that exposes a conductive layer to be transformed into a passive layer as in the claimed invention. Instead, Carducci et al. heats a resistive top dielectric layer of a substrate prior to etch processing via a plasma without disclosing an excitation system that is capable of acting upon a conductive layer, as afforded by the memory cell formation system of claim 1. Consequently, the cited reference does not disclose **an excitation system that electrically excites the fluorine based gas to establish a plasma in the chamber which interacts with a conductive surface to transform the surface from a conductive material into a passive layer, as recited in independent claim 1.**"

Art Unit: 1763

The Examiner disagrees. Carducci et al teaches an excitation system that electrically excites the fluorine based gas to establish a plasma in the chamber, which interacts with the substrate to process the substrate. Carducci et al does not teach that the substrate has a conductive surface or that the plasma reacts with the conductive surface to transform the surface from a conductive material into a passive layer. Thus, the only difference from the present invention and cited art is the type of substrate (i.e. a substrate with a conductive layer as apposed to a substrate with dielectric layer), and how the plasma is used (i.e. to react with a conductive layer as apposed to etching a dielectric layer). As discussed above, the case law and MPEP clearly state that the substrate worked on is of "no significance in determining patentability of the apparatus claim", and "does not impart patentability to the claims"; the apparatus is defined by its structure rather than function; and the process in which the apparatus is intended to be employed does not differentiate the claimed apparatus from the prior art apparatus. The apparatus of Carducci et al teaches all of the claimed structure, and is capable of being used in the claimed manner (i.e. if a substrate having a conductive material were placed in the chamber of Carducci et al and exposed to a fluorine plasma formed by the excitation system of Carducci et al, the plasma would form the same passive layer on the conductive material).

In regard to the argument:

"Moreover, for example, the conductive material in claim 1 is an underlying layer exposed to the plasma by a trench formed within one or more layers of dielectric material spread across a wafer whereon the memory cell fashioning occurs, as recited in claim 4. The Examiner incorrectly contends that the apparatus of Carducci et al. is capable of processing substrates having the claimed layers and features. Carducci et al. processes a resistive dielectric layer of a substrate surface, but does not contemplate an upper portion of a deposition of conductive material being exposed to the plasma by a trench formed within one or more layers of dielectric material spread

Art Unit: 1763

across a wafer whereon the memory cell fashioning occurs. The claimed invention, for example, employs a trench in the dielectric material of the wafer to allow the upper surface of an underlying conductive material to be exposed to a plasma in order to transform the upper portion into a passive layer to allow a selectively conductive layer to be grown out of the conductive material. To the contrary, the reference is directed towards generally exposing the resistive top dielectric layer of the substrate to the plasma for etch preparation without providing a system that limits exposing the plasma to conductive material that is exposed by a trench within one or more layers of dielectric material, as in the claimed invention."

The Examiner disagrees. First, the trench limitation is not found in claim 1 and cannot be used to overcome the rejections of claim 1. Second, the limitation is clearly part of the substrate and not part of the apparatus. The trench is part of the substrate being treated and not part of the structure of the apparatus. Therefore, as discussed above it "is of no significance in determining patentability of the apparatus claim" and "does not impart patentability to the claims". Third, contrary to the Applicant's assertion, no "system that limits exposing the plasma to conductive material that is exposed by a trench within one or more layers of dielectric material" is claimed. Fourth, Carducci et al teaches trenches (vias) formed within multiple layers of dielectric material that limit the exposure of a copper layer to the plasma (See figures 38A and 38B, and paragraphs 0218-0226).

In regard to the argument:

Independent claim 1 recites an excitation system that electrically excites the fluorine-based gas to establish a plasma in the chamber which interacts with a conductive surface to transform the surface from a conductive material into a passive layer.
Grimbergen et al. relates to reducing deposition of process residues on chamber surfaces by employing various chamber recess implementations

The Examiner disagrees. The Applicant has misstated the overall teachings of Grimbergen et al. Grimbergen et al is directed to plasma treatment apparatus that has recesses in various walls to prevent the deposition of products or bi-products of various plasma processes including etching, deposition, and ion implantation. The recesses

Art Unit: 1763

protect the windows that allow the RF energy into the process chamber to form a plasma, and the window for the monitoring system. Grimbergen et al teaches specific plasma excitation systems, gas supply system, temperature control system, pressure control system, monitoring and measurement system, and a controller for controlling all of the systems based on input from the monitoring and measurement system. The control system controls the thickness and composition of the material deposited, and the rate at which it is deposited. Grimbergen et al teaches that the chamber is capable of known plasma processing methods.

In regard to the argument, "Grimbergen et al. establishes a plasma in the chamber to facilitate etching of gates, contact holes and interconnect lines atop the resistive dielectric layer of the substrate...", the Examiner disagrees. The Applicant has misstated the capabilities of the plasma processing chamber of Grimbergen et al.

Grimbergen et al teaches in column 1 lines 15-38:

In substrate fabrication processes, semiconductor, dielectric, and conductor materials are formed on a substrate and etched to form patterns of gates, vias, contact holes or interconnect lines. These materials are typically formed by chemical vapor deposition (CVD), physical vapor deposition (PVD), oxidation and nitridation processes. For example, in CVD processes, a reactive gas is used to deposit a layer of material on the substrate, and in PVD processes, a target is sputtered to deposit material on the substrate. In oxidation and nitridation processes, a layer of oxide or nitride, typically silicon dioxide or silicon nitride, respectively, is formed by exposing the substrate to a suitable gaseous environment. In etching processes, a patterned etch-resistant mask of photoresist or hard mask is formed on the substrate by photolithographic methods, and the exposed portions of the substrate are etched by an energized gas. In such processes, it is often desirable to change process conditions or stop processing of the substrate at a predetermined stage. For example, in the etching of gate structures, it is desirable to stop etching of overlying polysilicon when the underlying gate oxide is reached. As another example, it is often desirable to stop a deposition, oxidation or nitridation process when a predetermined thickness of material is obtained.

and in column 17 line 55 through column 18 line 13:

The foregoing examples demonstrate that the present invention may be used to accurately and reliably monitor many different process conducted in a chamber 35. The invention reduces the formation of process residues upon a window 130, and may also reduce the erosion of the window 130, in a chamber 35. As a result an amplitude of interferometric radiation measured

Art Unit: 1763

through the window 130 remained high even after etching of a large number of substrates 30. The masking portion 140 and recess 145 also significantly reduced the attenuation of radiation transmitted through the window 130 for a large process run time, increased radiation signal detection levels, and reduced the need to stop processing to clean window 130. Consequently, the chamber 35 may be advantageously used for an extended time without stopping to remove or clean the window 130.

The present invention is described with reference to certain preferred embodiments thereof; however, other embodiments are possible. For example, the process monitoring system may be used for other applications, as would be apparent to one of ordinary skill, such as in sputtering chambers, ion implantation chambers, or deposition chambers. In addition, equivalent configurations of the window may be designed by others of ordinary skill based upon the teaching herein. Therefore, the spirit and scope of the appended claims should not be limited to the description of the preferred embodiments contained herein.

Clearly, Grimbergen et al teaches a plasma processing apparatus capable of performing any plasma processing methods.

In regard to the argument:

"... the excitation system taught by the cited reference is incapable of producing a plasma that acts upon a conductive surface as in the claimed invention. Rather, the cited reference provides a system that acts upon the top dielectric layer of a substrate in order to prepare the substrate for etching, but does not disclose a system that is able to facilitate memory cell formation. Consequently, Grimbergen et al. fails to disclose the system of independent claim 1.

The Examiner disagrees. As discussed above, Grimbergen et al is a fully functional plasma processing apparatus capable of performing any plasma processing method.

The applicant has presented no support for the assertion that "the cited reference is incapable of producing a plasma that acts upon a conductive surface as in the claimed invention". In fact, the Applicant has presented no limitations or requirements for the plasma in the claims or specification. Therefore, one of ordinary skill in the art would conclude that no special plasma parameters are required. Furthermore, memory cell formation requires many single steps. These steps include depositing material, and etching the material deposited. Clearly, the apparatus of Grimbergen et al is capable of "facilitate memory cell formation".

Art Unit: 1763

In regard to the argument:

Moreover, as discussed supra, the conductive material in claim 1 is an underlying layer exposed to the plasma **by a trench formed within one or more layers of dielectric material** spread across a wafer whereon the memory cell fashioning occurs, as recited in claim 4. Since Grimbergen et al. discloses a rudimentary system that exposes a resistive dielectric layer to a plasma to facilitate etching, the reference inherently does not disclose the excitation system of claim 1 which transforms a conductive layer into a passive layer, wherein the portion of the conductive layer that undergoes the transformation process is exposed to the plasma **by a trench formed within one or more layers of dielectric material**, as afforded by claim 4.

The Examiner disagrees. First, the trench limitation is not found in claim 1 and cannot be used to overcome the rejections of claim 1. Second, the limitation is clearly part of the substrate and not part of the apparatus. The trench is part of the substrate being treated and not part of the structure of the apparatus. Therefore, as discussed above it "is of no significance in determining patentability of the apparatus claim" and "does not impart patentability to the claims". Third, Grimbergen et al does not disclose "a rudimentary system that exposes a resistive dielectric layer to a plasma to facilitate etching" but a fully functioning plasma processing apparatus capable of deposition, etching, ion implantation or forming a fluorine plasma. Fourth, "the excitation system of claim 1 which transforms a conductive layer into a passive layer" does not transform a conductive layer into a passive layer. As claimed, the excitation system forms a fluorine plasma that transforms a conductive layer into a passive layer. Grimbergen et al clearly teaches an excitation system that forms a fluorine plasma. The fluorine plasma inherently transforms a conductive layer into a passive layer.

In regard to the argument:

Furthermore, claim 17 recites the system of claim 1, further comprising..., a control system operatively coupled to the measurement system, gas distribution system and excitation system, **the control system obtaining readings taken by the measurement and selectively adjusting at least one of the gas distribution system and excitation system in response thereto to facilitate at least one of forming the passive layer to a desired thickness, forming the passive layer at a desired rate, forming the passive layer to a desired**

Art Unit: 1763

composition and forming the passive layer at a desired location. Since Grimbergen et al. does not contemplate a system for formation of memory cells or an associated excitation system that can act upon a conductive surface to produce the required passive layer for such memory cell formation, Grimbergen et al. is further incapable of providing a control system that optimizes such passive layer formation. Consequently, Grimbergen et al. is silent regarding the features recited in claim 17.

The Examiner disagrees. Grimbergen et al, as discussed above, teaches a control system that receives input from the measurement system and controls the excitation system and gas supply system to optimize the process in the processing chamber. Grimbergen et al teaches that the measuring system can measure the composition of the layer, size or thickness of the layer, or the rate at which the layer is being removed (or deposited) (see column 12 line 7 through column 14 line 36). The specific type of layer being measured is an intended use of the apparatus and the measuring system is capable of measuring the thickness, rate, composition, or location of the passive layer. Therefore, since Grimbergen et al discloses the claimed structure, including a controller for optimizing the composition of the layer, size or thickness of the layer, or the rate at which the layer is being removed (or deposited); and the specific process or article worked on does not differentiate the apparatus claims, Grimbergen et al teaches the claimed apparatus.

In regard to the arguments directed to the rejection of claims 17-19 under 35 U.S.C. § 103(a) as being unpatentable over Carducci et al in view of Grimbergen et al, the Examiner disagrees. The Applicant has not specifically pointed out any faults or problems of the 103 rejection other than the individual alleged problems and shortcomings of Carducci et al and Grimbergen et al discussed above.

Art Unit: 1763

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

JRL
12/18/06

Conferees:


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QUALITY ASSURANCE SPECIALIST


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